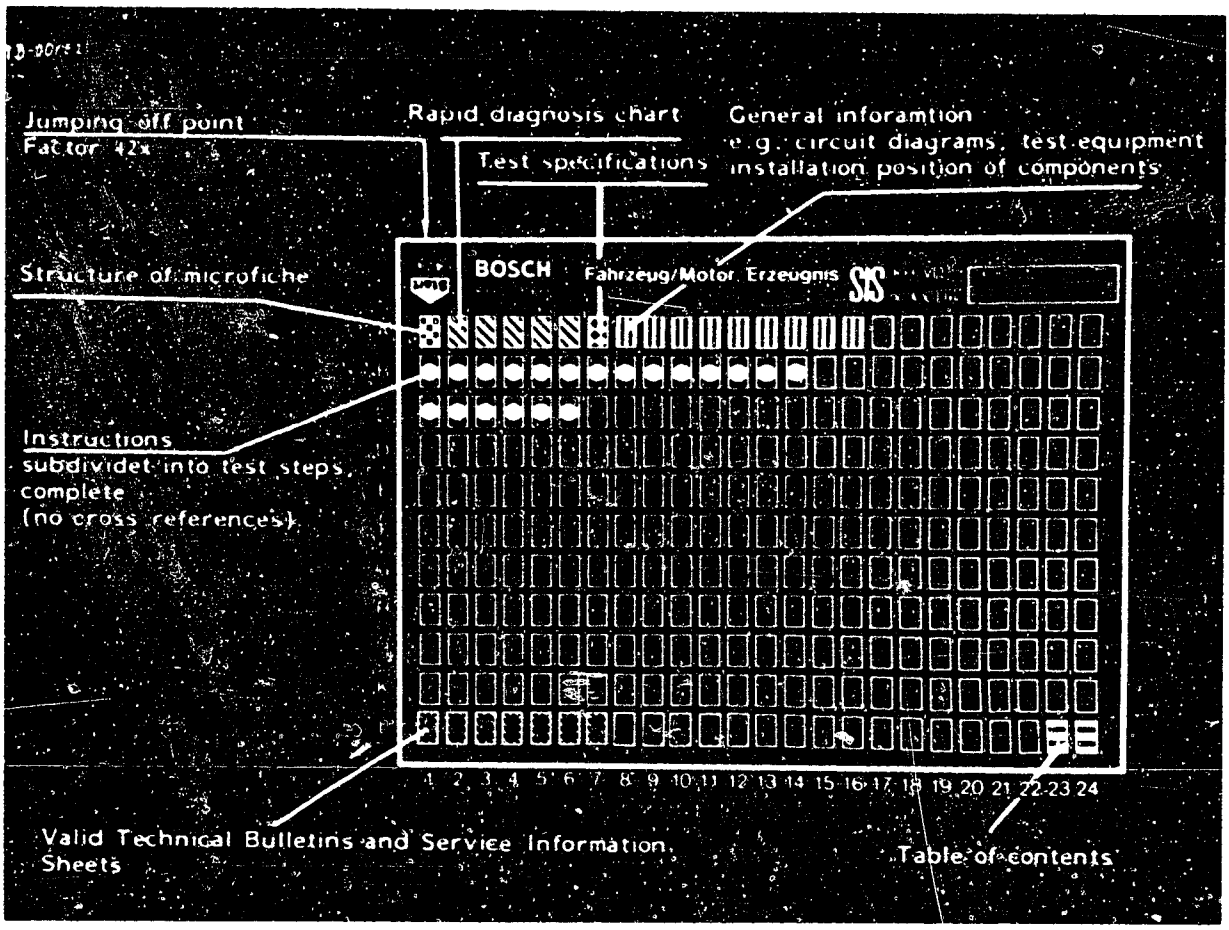
Structure of microfiche



1. Read from left to right

2. Title of microfiche (appears on each coordinate)

E16	Product/assembly/test step Vehicle/engine	

Coordinate

3. Limits of section

Beginning	Mid-section	End	One-page section

4. References to relevant test steps in test specifications; coordinate e.g. C6

C6

A1	Trouble-shooting program	↓

1. Rapid diagnosis chart

The following rapid diagnosis chart makes it possible for the experienced expert to quickly check the electrical/electronic part of the ignition system using normal workshop test equipment.

The rapid diagnosis chart contains the following information:

- Customer complaint
- Cause of the trouble
- Test instructions (if no coordinate given on the right, further possibilities for testing are indicated).
- Coordinates for detailed trouble-shooting.

If detailed information and instructions on trouble-shooting are necessary, always proceed according to the trouble-shooting program starting on coordinate B 1.

Rapid diagnosis chart

Customer complaint (symptom of trouble)

1. Starting motor operates, but engine fails to start
2. Rough idling
3. Poor throttle response
4. Engine lacks power
5. Misfiring
6. Fuel consumption too high
7. Engine pings when accelerating
8. Backfiring
9. Engine becomes too hot

1	2	3	4	5	6	7	8	9	Cause of trouble	Test instructions	Coordinates
●	●	●	●	●	●		●		Spark plugs defective	Assess using ignition oscillograms or remove spark plug and make visual examination.	---
●	●	●	●	●	●	●	●	●	Ignition timing incorrect	See Autodata test specifications	---
●	●	●	●	●					Shunt on secondary side	Assess ignition coil, ignition distributor, ignition harness and spark plug using ignition oscillogram or make visual examination	---
●	●	●	●	●					Open circuit on secondary side	Assess ignition coil, ignition distributor, ignition harness and spark plug using ignition oscillogram, or test for continuity using ohmmeter	---
●									Open circuit on primary side	Test voltage supply to trigger box or test primary circuit	C 3 C 5
●									Voltage increase for starting defective	Test voltage increase for starting for trigger box and/or ignition coil	B 11
●	●	●	●	●					Ignition coil defective	Make visual examination, electrical test	B 5

Customer complaint (symptom of trouble)

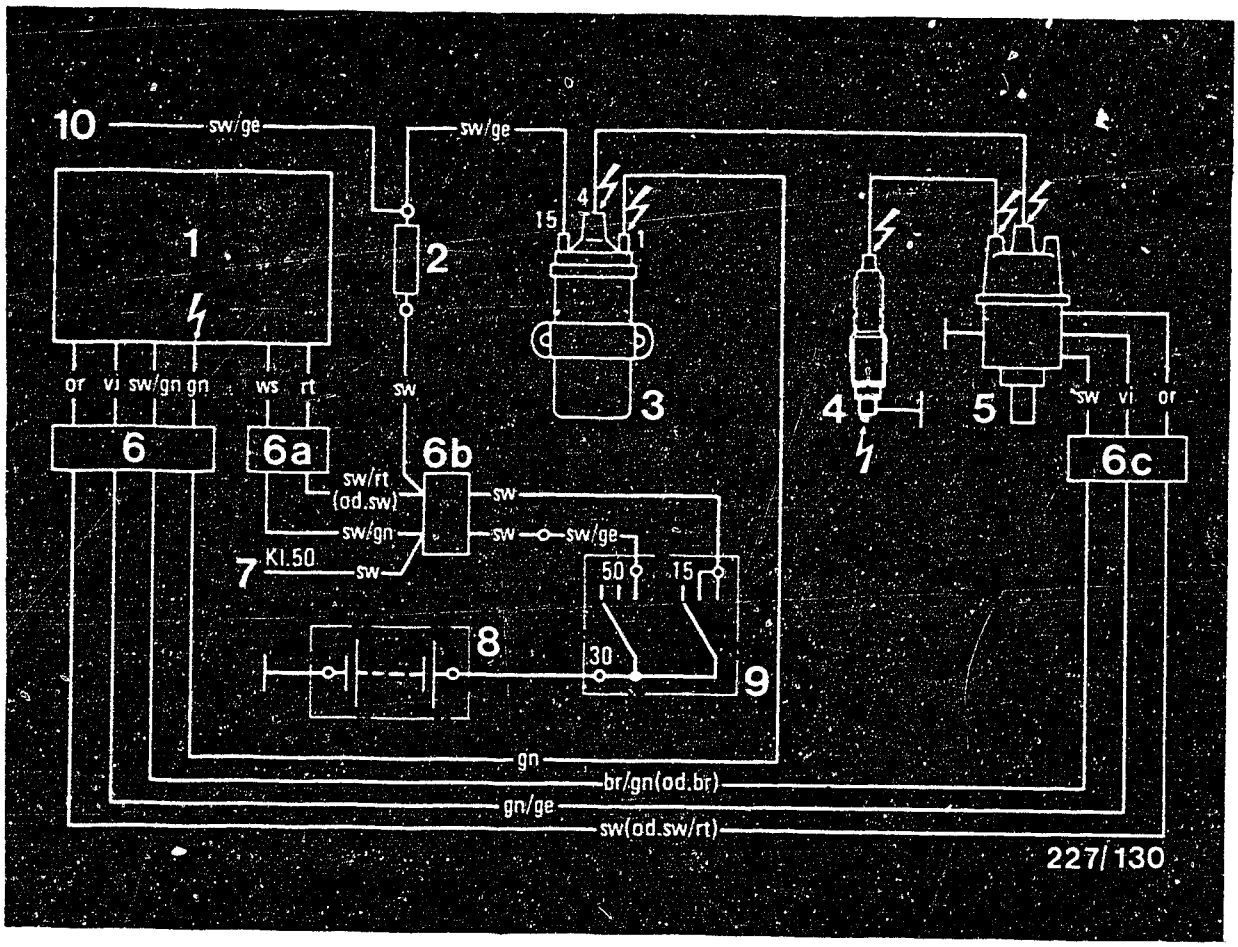
1. Starting motor operates, but engine fails to start
2. Rough idling
3. Poor throttle response
4. Engine lacks power
5. Misfiring
6. Fuel consumption too high
7. Engine pings when accelerating
8. Backfiring
9. Engine becomes too hot

1	2	3	4	5	6	7	8	9	Cause of trouble	Test instructions	Coordinates
		●	●	●	●				Interference-suppression resistors defective	Assess using ignition oscillogram or perform resistance measurement	-
	●	●	●		●	●	●	●	Centrifugal advance defective	See Autodata test specifications	-
		●	●		●	●		●	Vacuum advance defective	See Autodata test specifications	-
●									Trigger box defective	Test trigger box output stage, test primary voltage	B 17 B 19
●									Ignition distributor pickup system defective	Pick-up resistance, pick-up winding short-circuit to ground, check pick-up system for mechanical damage.	C 1
●	●	●	●	●					Engine-speed limiter defective	Test cut-out speed, or perform visual examination.	
●									Firing sequence incorrect	See Autodata test specifications	

2. Test specifications

Ignition coil primary		1.0...1.7 Ω	B5
Ignition coil secondary		7.0...12.3 Ω	
Series resistor (resistance cable)		1.0...1.2 Ω	
Voltage drop Ignition coil with ignition on		≧3.1 V at U_B ≧11 V	B7
Voltage supply Trigger box with ignition on		max. 1.0 V below U_B	B8
Dwell angle at n = 2000 + 50 min^{-1}	4 cyl.	45...75° (50...83%)	B15
	6 cyl.	30...50° (50...83%)	
Trigger box output stage with ignition on		max. 2 V	B17
Primary voltage with engine idling		330...410 V	B19
Resistance of coil section	Bosch 4 cyl.	890...1570 Ω	C1
	Bosch 6 cyl.	485...850 Ω	
	Motorcraft 6 cyl.	495...880 Ω	
Ground connection of coil element		R = ∞	

See Autodata test specifications for setting values for ignition, idle speed, exhaust gas, valve play etc.



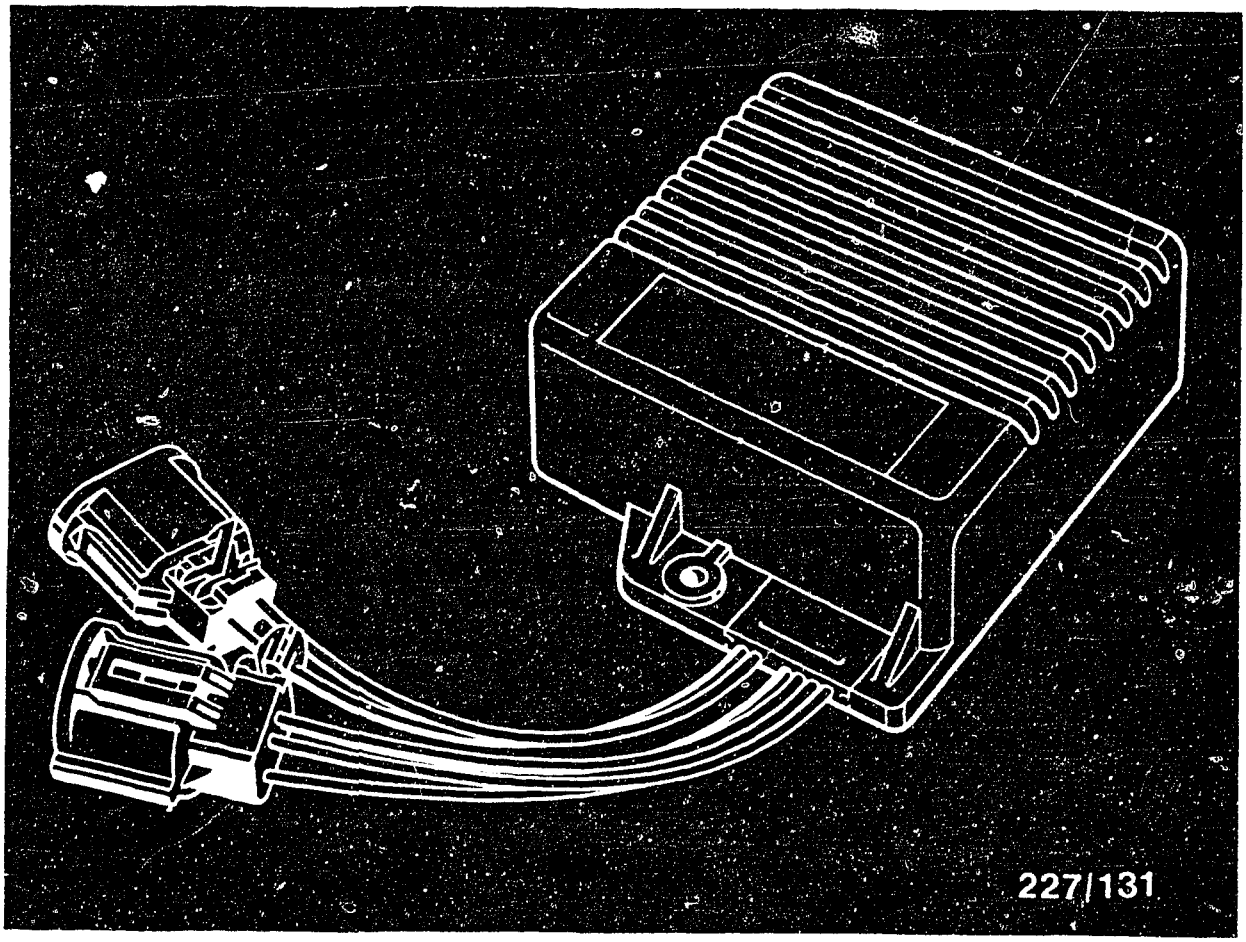
1 = Trigger box
2 = Ballast resistor cable
3 = Ignition coil
4 = Spark plug
5 = Ignition distributor
6, 6a-c = Plug connectors
7 = To starting motor term. 50
8 = Battery
9 = Ignition and starting switch
10 = To starting motor term. 15a (16)

⚡ = Dangerous voltages (400 V - 25 kV)

br = Brown
ge = Yellow
gn = Green
or = Orange
rt = Red
sw = Black
vi = Violet
ws = White

Note: Colors of leads may change

3. Electrical termina' diagram



TCI-trigger box

4. Installation position of components

The trigger box is mounted in the engine compartment.

5. Necessary test equipment, aids

Motortester e.g.	MOT 002.00	0 684 000 200
Spark gap e.g. Ignition coil and condenser tester	EFAW 106 A	0 681 100 001
or Single spark gap	EF 1177/7	1 684 531 000
5 kΩ sleeve-type suppressor		0 356 500 001
Ohmmeter	ETE 014.00	0 684 101 400
or e.g.	Pontavi Wh2	Commercially available
Voltmeter e.g.	ETE 014.00	0 684 101 400
Adapter for ignition coil		1 684 448 115
and		1 684 448 117
Test prods		commercially available

6. Danger of accident on electronic ignition systems

Increased demands of modern engines on the ignition system combined with the desire for freedom of maintenance have recently led to electronic ignition systems being fitted as standard. Usually the ignition power of electronic systems (of almost all manufacturers) is higher than that of conventional systems, and there are signs of further increases in power. Electronic ignition systems thus reach a power range which can be highly dangerous if live parts or terminals are touched (both on the primary as well as the secondary sides).

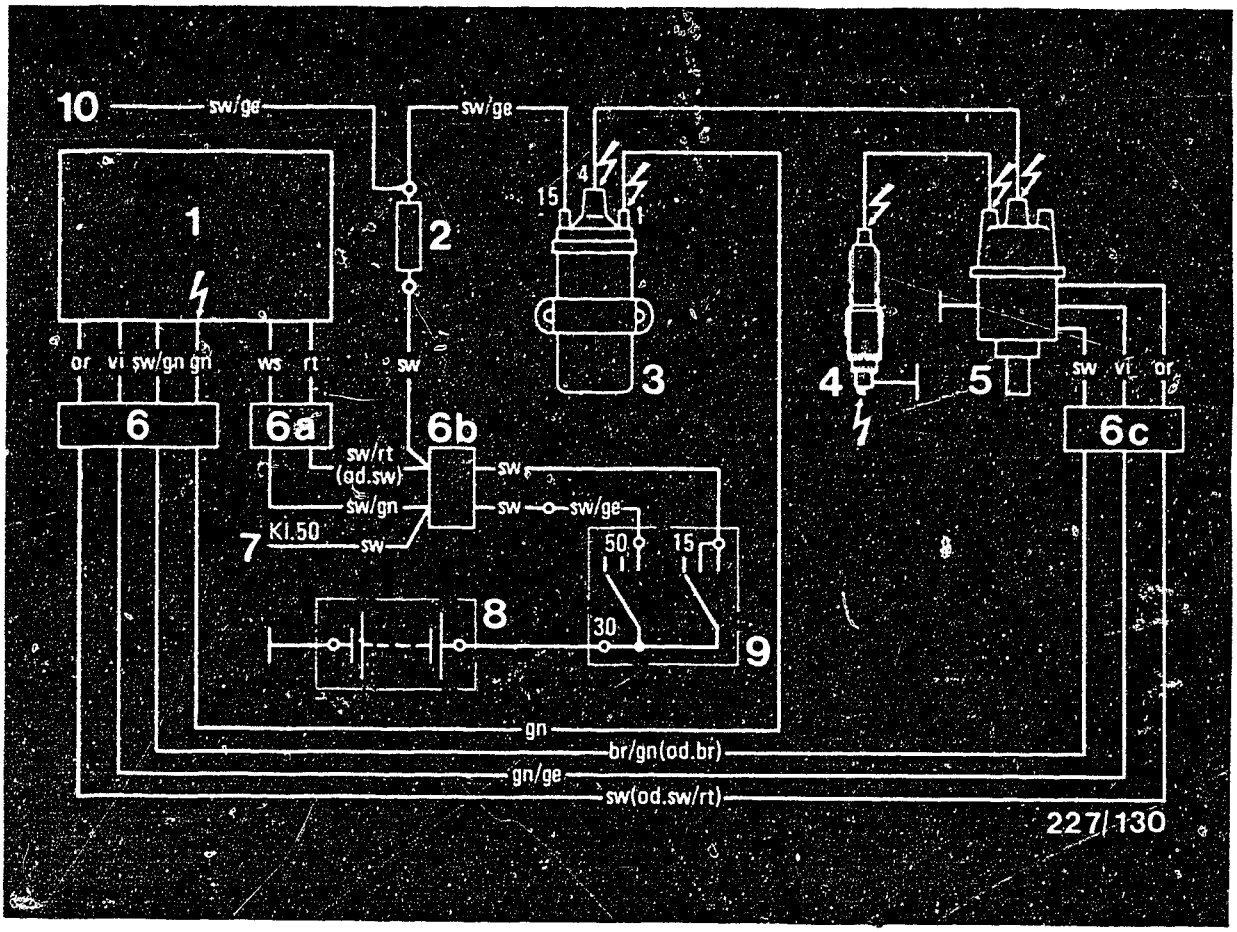
In this connection we should like to point out that the VDE regulations, in particular VDE 0104/7.67 and/or the respective national regulations must be followed when testing or working on the ignition system.

The ignition should always be switched off when working on the ignition system (switch off ignition or voltage source). Such work includes:

- Connecting of engine test equipment (timing light, dwell-tach tester, ignition oscilloscope, etc.).
- Replacing parts of the ignition system (spark plug, ignition coil, ignition distributor, H.T. ignition cable, etc.).

If, while testing the ignition system or during adjustment work on the engine (e.g. carburettor), it becomes necessary to switch on the ignition (switch on ignition or voltage source), the above-mentioned dangerous voltages occur over the entire system.

The danger of accident exists, therefore, not only on the individual assemblies of the ignition system (e.g. ignition distributor, ignition coil, trigger box, ignition harness), but also on the wiring harness (e.g. tachometer connection, diagnostic plug), at plug-in connections and test equipment.



1 = Trigger box
2 = Ballast resistor cable
3 = Ignition coil
4 = Spark plug
5 = Ignition distributor
6, 6a-c = Plug connectors
7 = To starting motor term. 50
8 = Battery
9 = Ignition and starting switch
10 = To starting motor term. 15a (16)

ϟ = Dangerous voltages (400 V - 25 kV)

br = Brown
ge = Yellow
gn = Green
or = Orange
rt = Red
sw = Black
vi = Violet
ws = White

Note: Colors of leads may change

The dangerous locations are marked with danger arrows taking the example of the terminal diagram of an electronic ignition system.

7. Important vehicle information

- During the compression test, either pull off the trigger-box plug or firmly connect terminal 4 of the ignition coil to ground using an extra cable (dangerous voltages, insulation damage at ignition coil, ignition distributor or ignition harness).

  Note: The extra cable must be suppressed with at least 2 kΩ, e.g. with the interference suppression sleeve (5 kΩ) 0 356 500 001.

- Resistance measurements must only be performed with the ignition switched off or with the battery disconnected (measuring instrument defective).

- In order to prevent the trigger box from being irreparably damaged, the secondary side of the ignition system must have at least 2 kΩ interference suppression.

- Do not disconnect the battery while the engine is running.

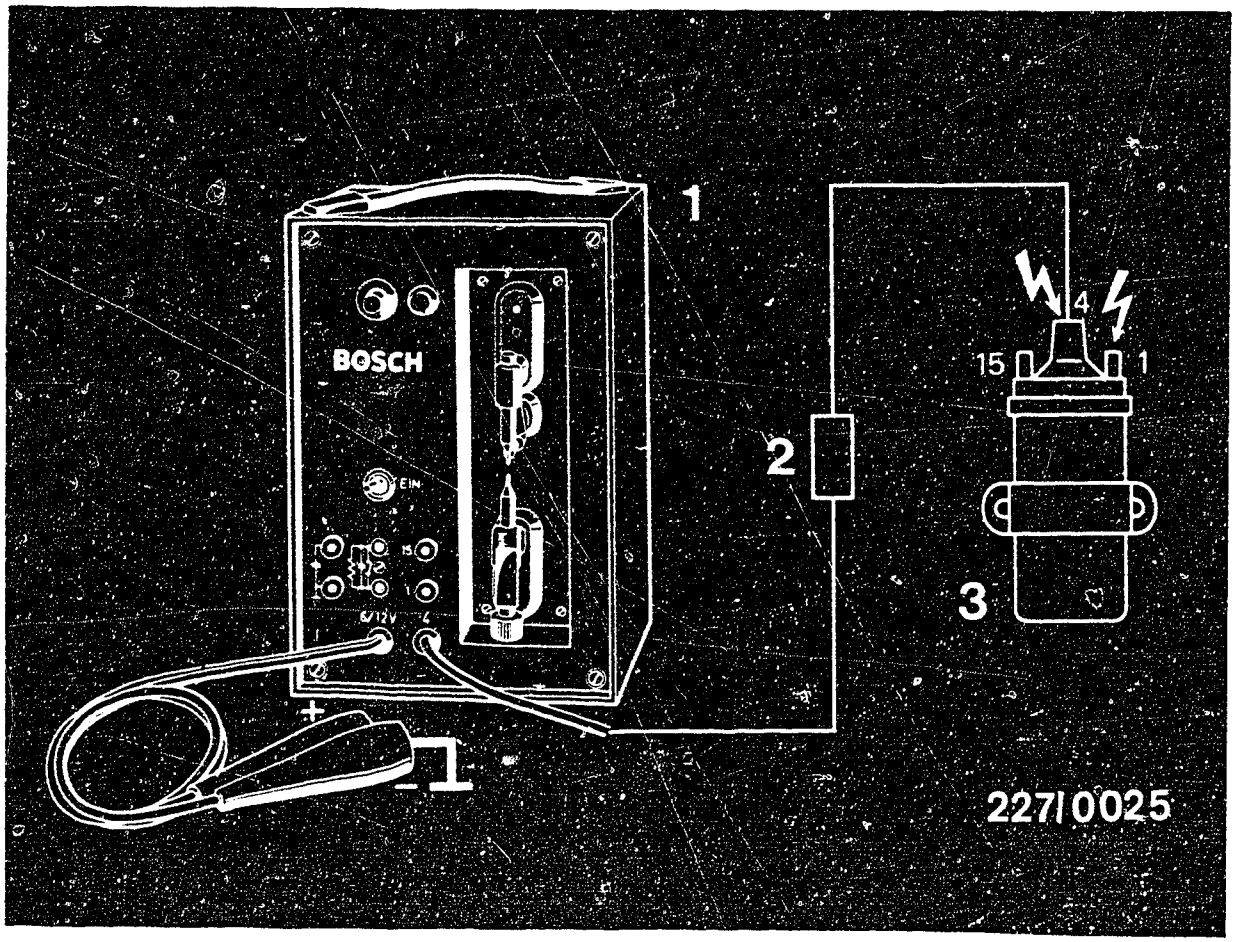
- Incorrect battery polarity will lead to the destruction of the trigger box and ignition coil.

- Do not use a starting aid with more than 16 V or a fast charger for starting.

- The specified ignition coil (see Part No.) must not be replaced with a different ignition coil.

- No battery + and no test lamp may be connected to ignition coil term. 1 (trigger box will be destroyed).

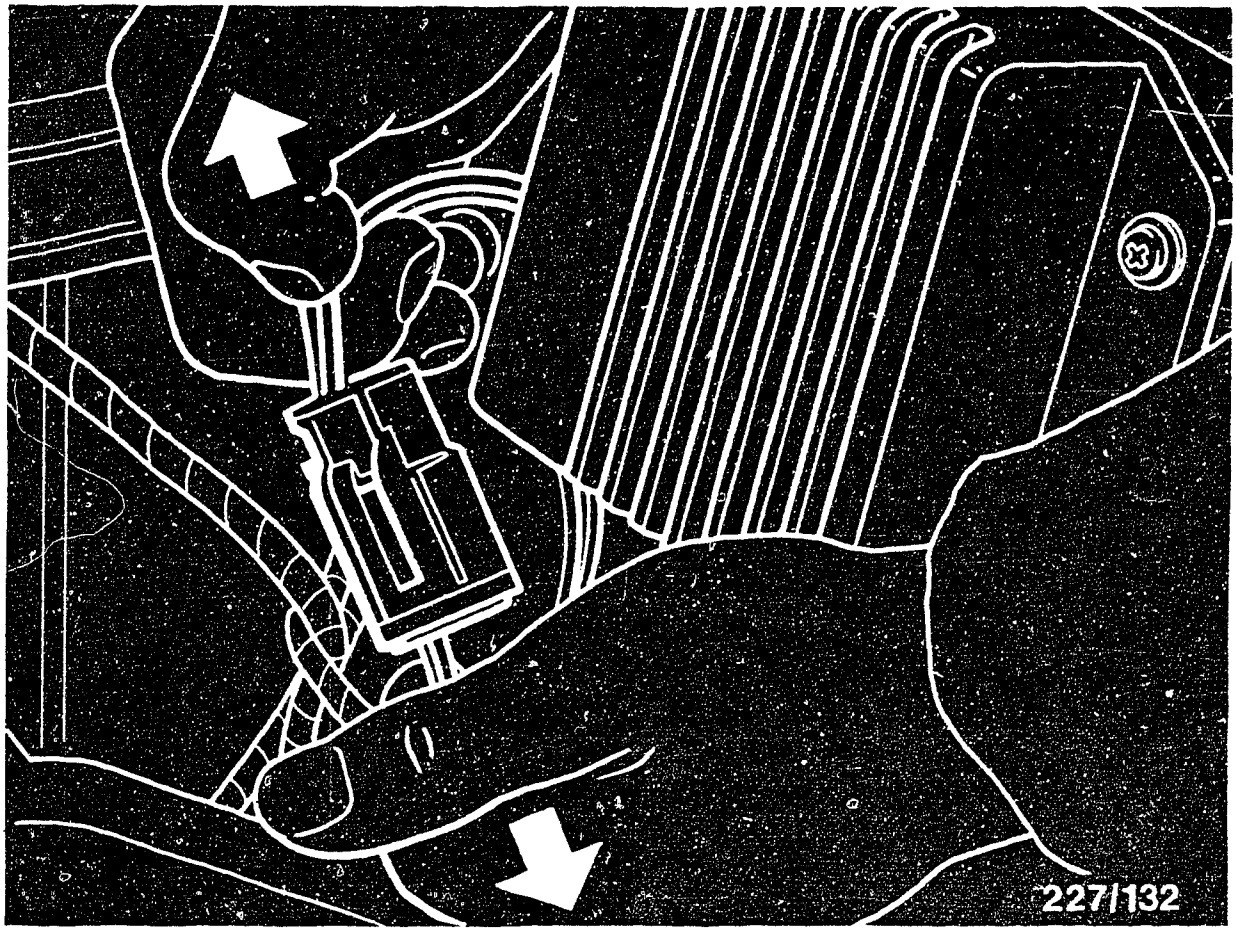
- Ignition cable from ignition coil term. 4 to ignition distributor term. 4 must not be removed during operation.



1 = Spark gap
2 = 5 kΩ sleeve-type suppressor
3 = Ignition coil

= Dangerous voltages (400 V - 25 kV)

- In order to prevent the trigger box from being irreparably damaged, when using a spark gap, an interference-suppression resistor of at least 2 kΩ must be connected between the spark gap and ignition coil terminal 4, e.g. sleeve-type suppressor (5 kΩ) 0 356 500 001.



In order to undo the plug connectors of the trigger box, it is necessary to pull at the ends of the cables. See picture.

Do not remove the grease in the plugs!

8. Trouble-shooting program

Procedure

The trouble-shooting program is divided into 3 rows of boxes.

The left-hand row contains test instructions and test specifications.
The center row contains repair instructions.
The right-hand row contains the illustrations/terminal diagrams belonging to the text and the explanation of the items in the picture.

If the questions asked in the left-hand row can be answered conclusively with "Yes", then proceed to the next test down.

If the answer to the question is "No", branch to the center row and carry out the tests given there.

Before testing, make sure of the following:

Battery fully charged, fuel system O.K., engine mechanically O.K. (e.g. compression, valve clearance etc.). Ambient temperature/ignition system temperature 0° to+100 °C (temperature has a considerable effect on measured values).

Beginning of trouble-shooting program

Starting motor operates, engine fails to start or misfires or lacks power.

Yes

Continued on B 3

yes

Test primary voltage. If no oscilloscope or tachometer is available, check whether there is an ignition spark across the spark gap.

Primary voltage with oscilloscope
Connect oscilloscope to ignition coil according to operating instructions. Start the engine. Oscilloscope must show a primary voltage (of any value).

Primary voltage with tachometer tester
Connect tachometer tester to ignition coil according to instructions.
Start the engine.
Tachometer tester must indicate a value (any value).

Ignition spark with spark gap
Disconnect ignition cable 4 from ignition coil.
Connect the spark gap including sleeve-type suppressor (5 kΩ) to ignition coil. Adjust spark gap to 5 mm. Start the engine. There must be sparks across the spark gap.

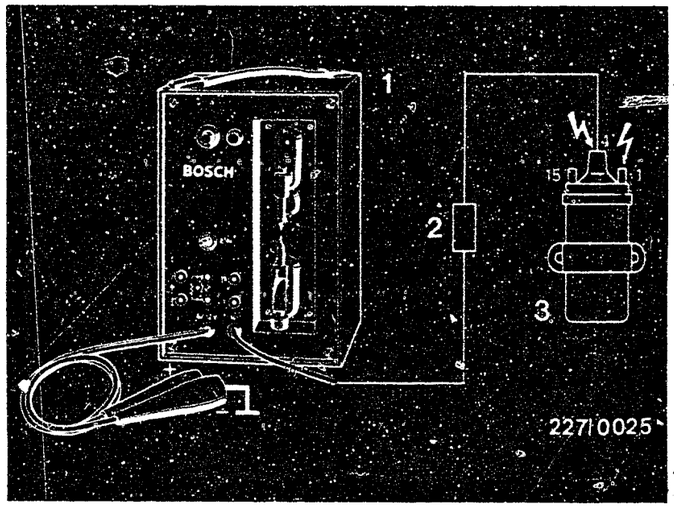
Primary voltage on oscilloscope or ignition sparks across spark gap?

no → If no primary voltage or no ignition spark, continue testing at C 1.

Testing as from B 5 not necessary.

yes

Continued on B5/6



1 = spark gap
2 = 5 kΩ sleeve-type suppressor
3 = ignition coil
⚡ = dangerous voltages

Yes

Test the distributor cap, rotor, ignition cables and spark plugs.

High-tension side O.K.?

No → Repair high-tension side

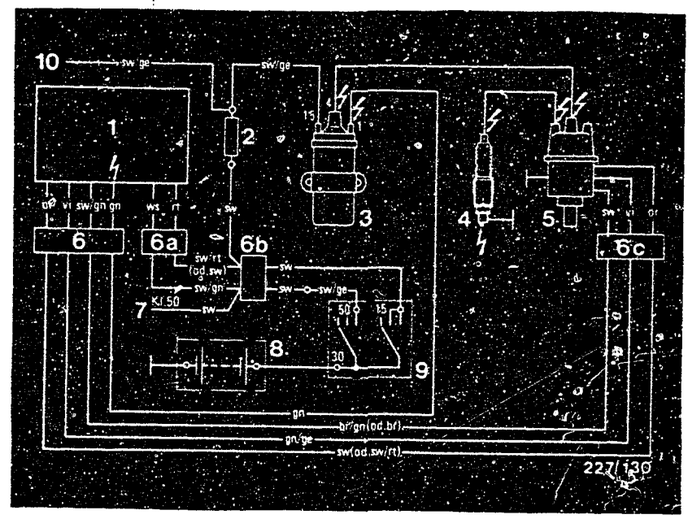
Yes

Test ballast resistor cable and ignition coil.
Ballast resistor cable
Undo both plug connectors of blue ballast resistor cable (in engine compartment on left-hand side member).
Connect ohmmeter to blue ballast resistor cable.
Resistance value 1.0...1.2 Ω.
Ignition coil
Ignition coil primary (term. 15 and 1)
1.0...1.7 Ω
(Take resistance of test lead with test prods into account).
Ignition coil secondary (term. 1 and 4)
7.0...12.3 kΩ
Resistance values O.K.?

No → Replace ballast resistor cable and/or ignition coil.

Yes

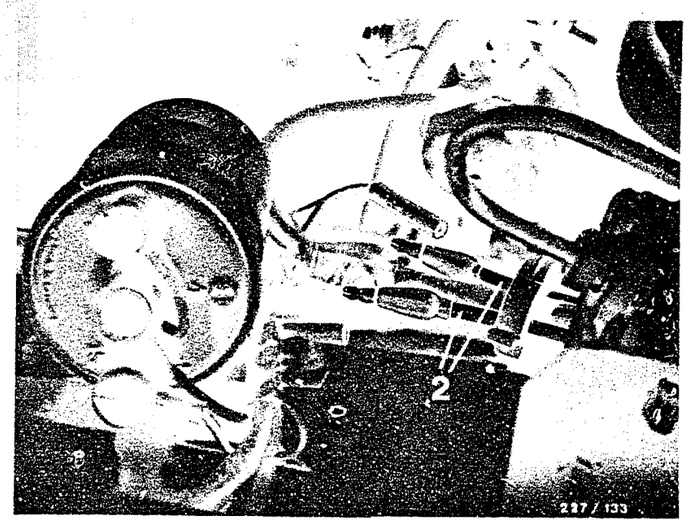
Continued on B 7/8



1 = Trigger box
2 = Ballast resistor cable
3 = Ignition coil

= Dangerous voltages (400 V - 25 kV)

2 = Ballast resistor cable (blue)



Yes

Test voltage drop at ignition coil.

Connect voltmeter to ignition coil term. 15 and 1. (Use adapter for ignition coil).
Switch on the ignition.
The voltmeter must show ≧ 3.1 V with a battery voltage of ≧ 11 V.

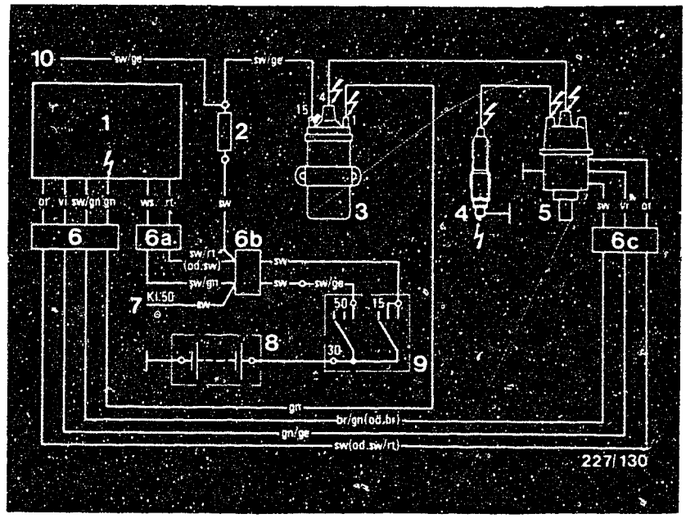
Voltage value O.K.?

No →

Disconnect the negative and positive cables from the battery. Undo the four-pole trigger-box plug connector. Switch on the ignition. Check for contact resistance in cables from positive battery terminal to ignition coil term. 15 as well as cable from ignition coil term. 1 to four-pole plug connector (on wiring-harness side) see Fig. Item 6.
Total contact resistance max. 0.3 Ω without ballast resistor cable (take resistance of test lead with test prods into account).
Eliminate contact resistance.

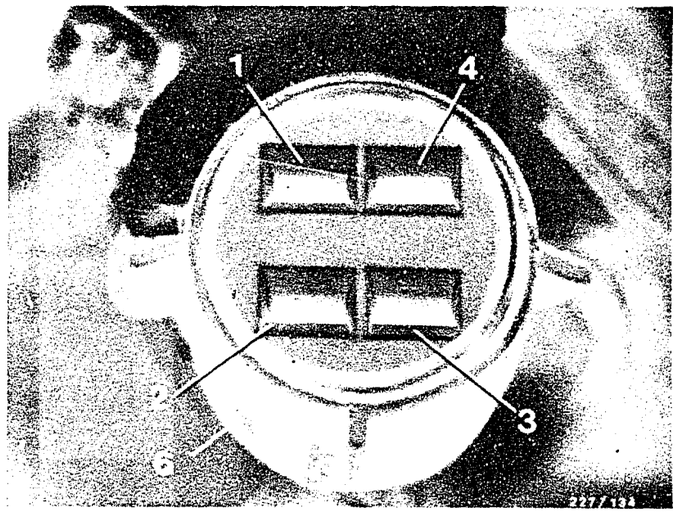
Yes

Continued on B9/10



1 = Trigger box
2 = Ballast resistor cable
3 = Ignition coil
6 = 4-pole plug connector
8 = Battery
9 = Ignition and starting switch

= Dangerous voltages (400 V - 25 kV)
1 = Ignition coil connection
2, 3, 4 = Ignition distributor connection
6 = Four-pole plug connector



Yes

Test <u>trigger box voltage supply</u>.

Connect voltmeter with test prod to red lead from 3-pole trigger-box plug (pierce cable insulation) and vehicle ground.
Switch on ignition.
The voltage measured must be max. 1 V lower than battery voltage.

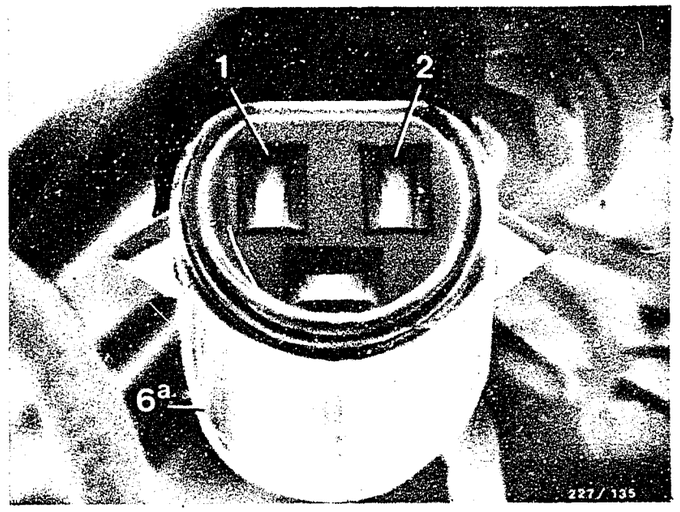
Voltage value O.K.?

No →

Disconnect the negative and positive cables from the battery.
Undo three- and four-pole plug connectors of trigger box. Switch on ignition.
Check for contact resistance in cables from battery positive to three-pole plug connector (wiring-harness end) see Fig. Item 1, including cables from negative battery terminal via ignition distributor (black lead) to four-pole plug connector (wiring-harness end) see fig. Item 4. Total contact resistance max. 0.3 Ω (take resistance of test leads with test prods into account).
Eliminate contact resistance.

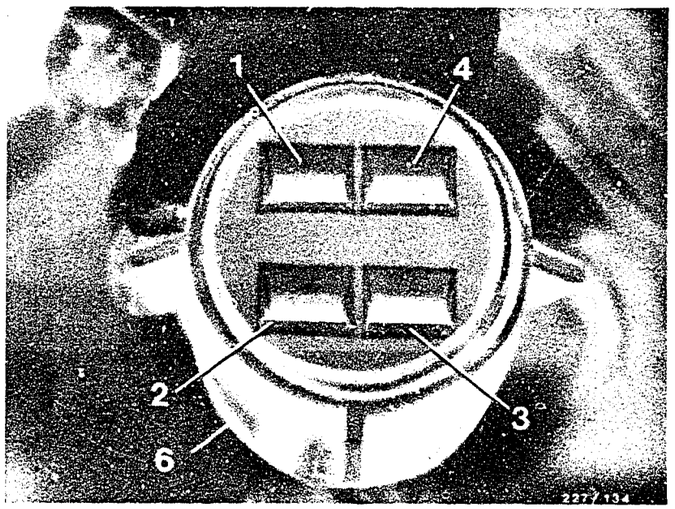
Yes

Continued on B11/12



1 = Ignition and starting switch connection (15)
2 = Ignition and starting switch connection (50)
6a = Three-pole plug connector

1 = Ignition coil connection
2, 3, 4 = Ignition distributor connection
6 = Four-pole plug connector



yes

Test voltage increase for starting for trigger box.
Undo three-pole trigger box plug connector.
Connect voltmeter with test prod to three-pole plug connector (on wiring-harness side) see picture item 2 and to vehicle ground.
Operate starting motor.
The voltmeter must indicate battery voltage.
Voltage O.K.?

No → Test for open circuit in cables and connections from ignition and starting switch term. 50 to three-pole plug connector (on wiring-harness side).
Eliminate open circuit.

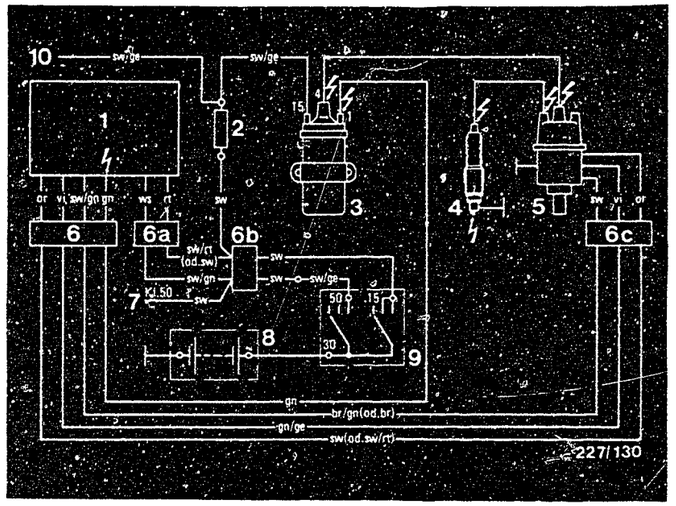
yes

Test voltage increase for starting for ignition coil.
Re-connect three-pole trigger box plug connector. Connect voltmeter (+) to battery positive and ignition coil term. 15. (Use adapter for ignition coil).
Operate starting motor.
The voltmeter must indicate max. 1.0 V during cranking.
Voltage O.K.?

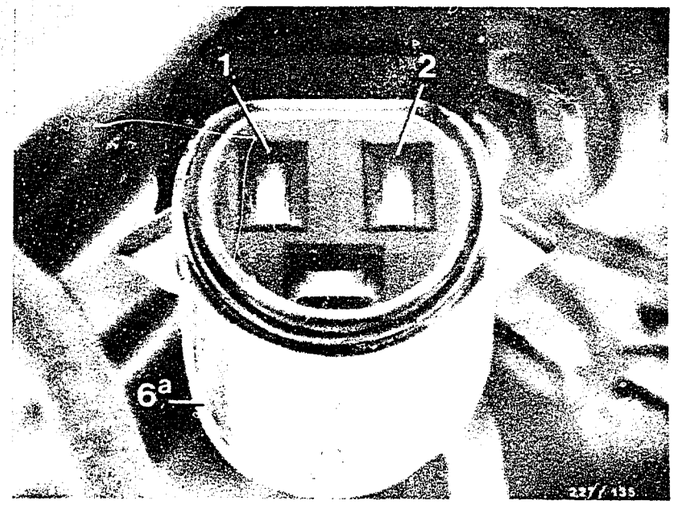
No → Test for open circuit in cable from starting motor relay to ballast resistor cable, or contact 15a (16).
Eliminate open circuit.

yes

Continued on B13/B14



1 = Trigger box
2 = Ballast resistor cable
3 = Ignition coil
6a= 3-pole plug connector
9 = Ignition and starting switch
10 = To starting motor term. 15a (16)
⚡ = Dangerous voltages (400 V - 25 kV)
1 = Connection from term. 15
2 = Connection from term. 50
6a= 3-pole plug connector



Yes

Engine running? — No → Replace trigger box.

Yes

Test ignition setting (Autodata test specifications). Adjustment correct? — No → Adjust ignition.

Yes

Continued on B15/16

Yes

Test dwell angle (only for a short period and with warm engine).

Connect the dwell-angle tester to the ignition coil as per operating instructions. (Use adapter for ignition coil).
Start engine.
n = 2000 + 50 min^{-1}
4 cyl. 45°...75° (50...83%)
6 cyl. 30°...50° (50...83%)
Dwell angle O.K.?

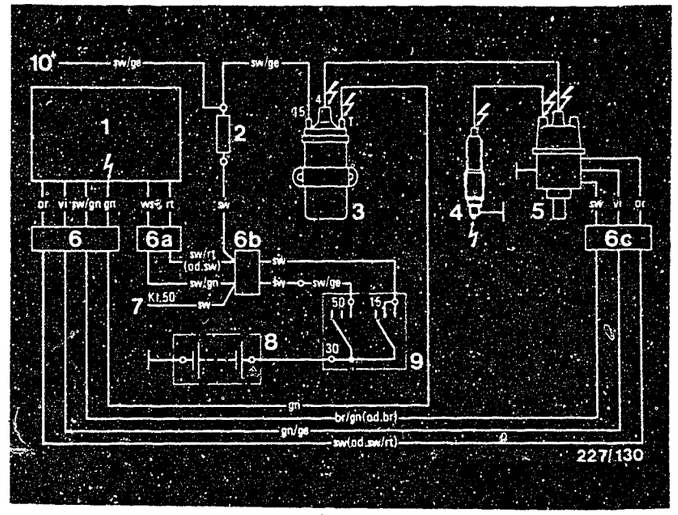
No →

1. Test resistance of coil section including electric cable.
Undo four-pole trigger-box plug connector.
Connect ohmmeter with test prods to four-pole plug connector (wiring-harness end) see Fig. Item 2 and Item 3.
The ohmmeter must show
890...1570 Ω for
Bosch 4 cyl. distributor
485...850 Ω for
Bosch 6 cyl. distributor
495...880 Ω for
Motorcraft 6 cyl. distributor.

If resistance value is not O.K., then replace coil section/ignition distributor or electric cable.
2. Test the ground connection of the coil section and electric cable.
Connect ohmmeter with test prod to four-pole plug connector (wiring-harness end) see Fig. Item 2 or Item 3 and vehicle ground.
The ohmmeter must indicate infinity (∞).
If resistance value is not O.K., then replace coil section/ignition distributor or electric cable.
3. Test ignition pulse generator for mechanical damage.
Visual examination: Timer core must not rub against the teeth of the pulse generator. If pulse generator not O.K., then replace pulse generator/ ignition distributor. If points 1 - 3 are O.K., then replace trigger box.

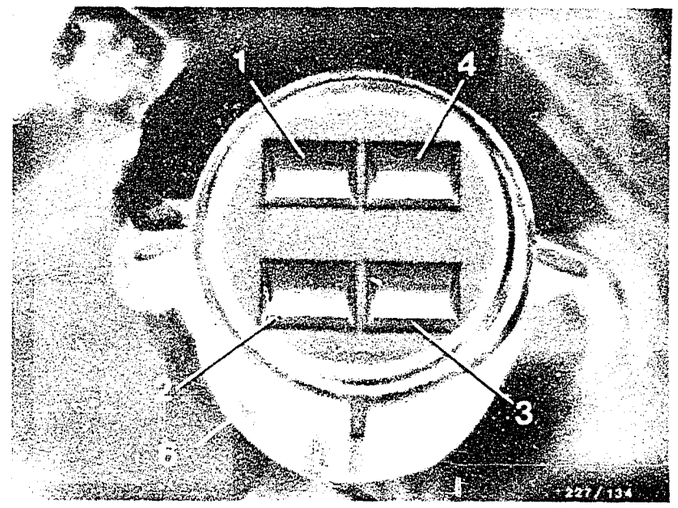
Yes

Continued on B17/18



1 = Trigger box
5 = Ignition distributor
6 = 4-pole plug connector

⚡ = Dangerous voltages (400 V - 25 kV)
1 = Ignition coil connection
2, 3, 4 = Ignition distributor connection
6 = Four-pole plug connector



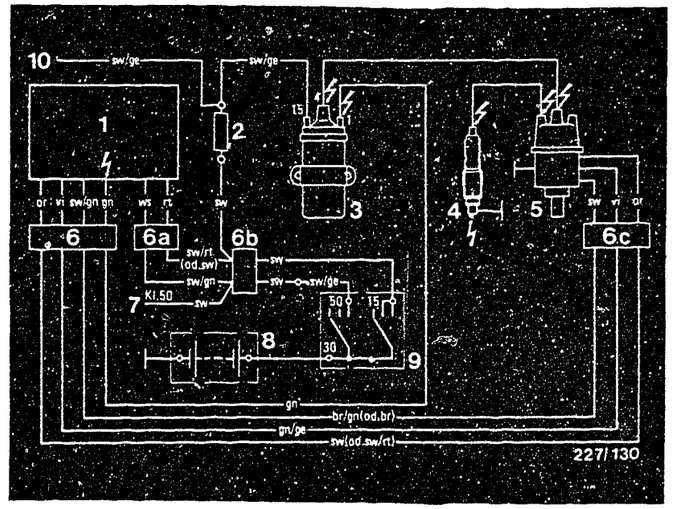
Yes

Test trigger box output stage.

Connect voltmeter to ignition coil term. 1 and ground (use adapter for ignition coil). Switch on ignition. The measured voltage must be max. 2 V.

Voltage value O.K.?

No → Replace trigger box.



1 = Trigger box
3 = Ignition coil
9 = Ignition and starting switch

⚡ = Dangerous voltages (400 V - 25 kV)

Yes

Continued on B19/20

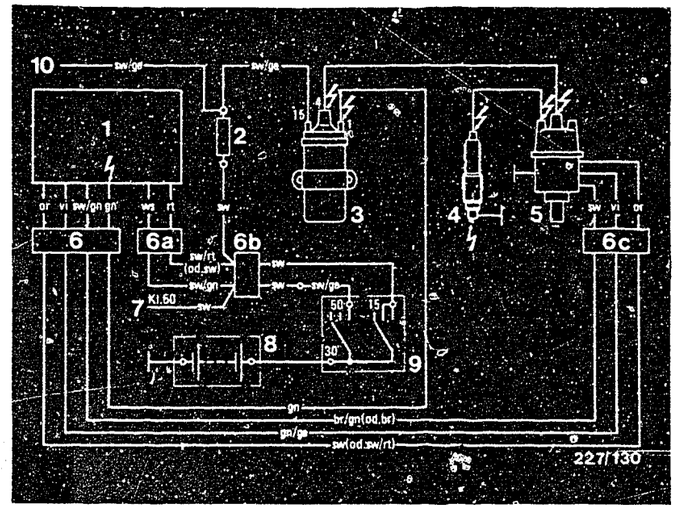
Yes

Test the primary voltage (if MOT series available).
Connect oscilloscope e.g. MOT 201 to ignition coil as per operating instructions (use adapter for ignition coil).
Run engine at idle.
The primary voltage measured must be 330...410 V. See diagram.
Voltage value O.K.?

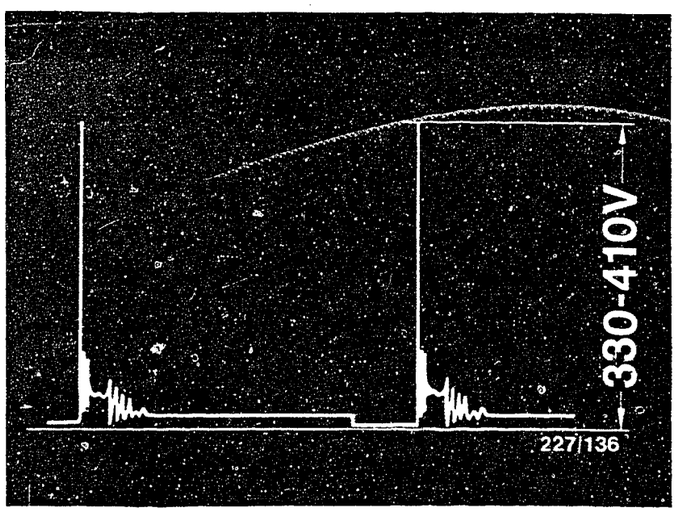
No → Replace trigger box

Yes

Ignition system O.K.
Test completed
Tests as from C 1 no longer necessary.
Please note:
If the cause of the customer's problem is not eliminated, then there are further faults in fuel system or the engine is not mechanically O.K.



1 = Trigger box
2 = Ballast resistor cable
3 = Ignition coil
6, 6a-c = Plug connectors
8 = Battery
9 = Ignition and starting switch
⚡ = Dangerous voltages (400 V - 25 kV)



No primary signal or no ignition spark
(continued from B 3)

Yes

Test resistance of coil section including electric cable.
Undo four-pole trigger box plug connector. Connect ohmmeter with test prods to 4-pole plug connector (wiring-harness end) see Fig. Item 2 or Item 3.
The ohmmeter must show
890...1570 Ω for
Bosch 4 cyl. distributor
485...850 Ω for
Bosch 6 cyl. distributor
495...880 Ω for
Motorcraft 6 cyl. distributor.
Resistance value O.K.?

No → Replace coil section/ignition distributor or electric cable.

Yes

Test ground connection of coil section and electric cable.
Connect ohmmeter with test prod to 4-pole plug connector (wiring-harness end) see Fig. Item 2 or 3 and vehicle ground. The ohmmeter must indicate infinity (∞). Resistance value (∞) O.K.?

No → Replace coil section/ignition distributor or electric cable.

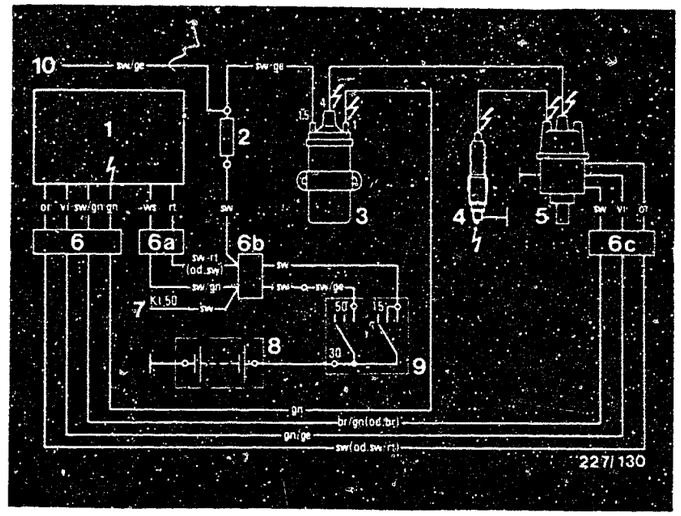
Yes

Test ignition pulse generator for mechanical damage.
Visual examination: timer core must not rub against the teeth of the pulse generator.
Pulse generator O.K.?

No → Replace pulse generator/ignition distributor.

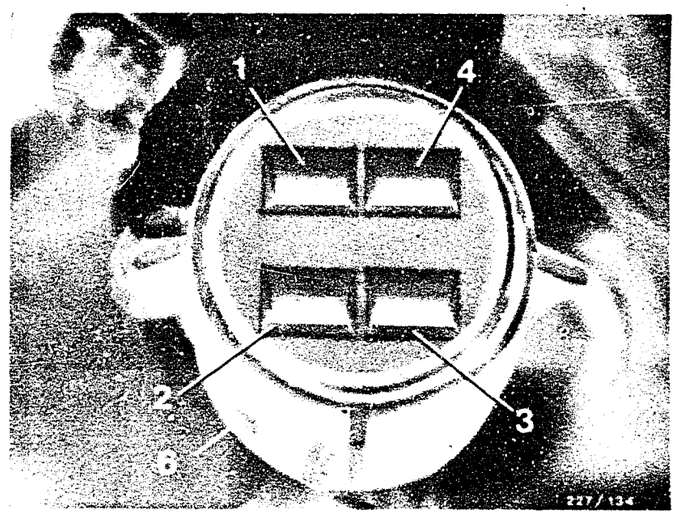
Yes

Continued on C 3/4



1 = Trigger box
2 = Ballast resistor cable
3 = Ignition coil
5 = Ignition distributor
6 = 4-pole plug connector

= Dangerous voltages (400 V - 25 kV)
1 = Ignition coil connection
2, 3, 4 = Ignition distributor connection
6 = 4-pole plug connector



Yes

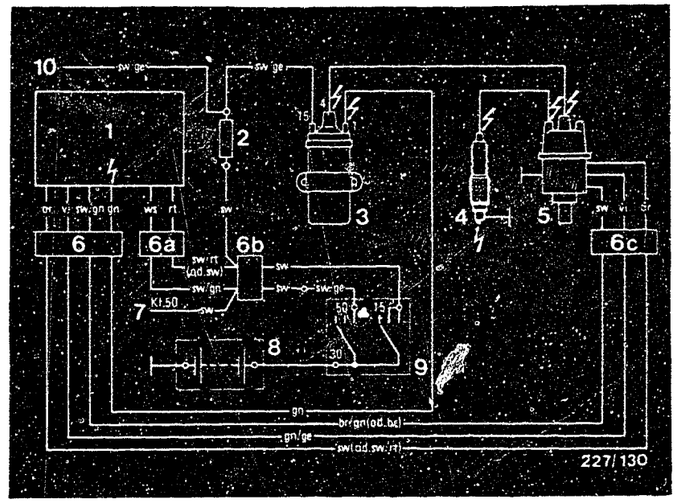
Test primary circuit.

Connect voltmeter with test prod to 4-pole plug connector (wiring-harness end) see Fig. Item 1 and vehicle ground. Switch on ignition. The voltmeter must indicate battery voltage.
Voltage value O.K.?

No → Check for open circuit in cables from positive battery terminal to ignition and starting switch, via ballast resistor cable to ignition coil term. 15, primary winding of ignition coil, as well as cable from ignition coil term. 1 to 4-pole plug connector (wiring-harness end) see Fig. Item 1. Eliminate open circuit.

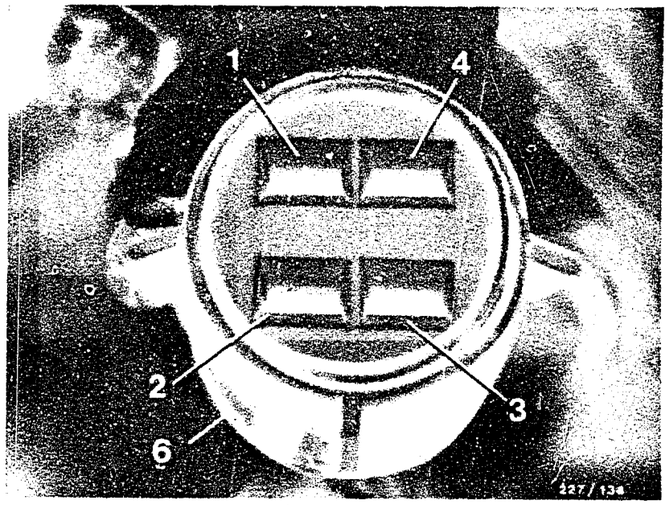
Yes

Continued on C5/6



1 = Trigger box
2 = Ballast resistor cable
3 = Ignition coil
6 = 4-pole plug connector
8 = Battery
9 = Ignition and starting switch

⚡ = Dangerous voltages (400 V - 25 kV)
1 = Ignition coil connection
2, 3, 4 = Ignition distributor connection
6 = 4-pole plug connector



yes

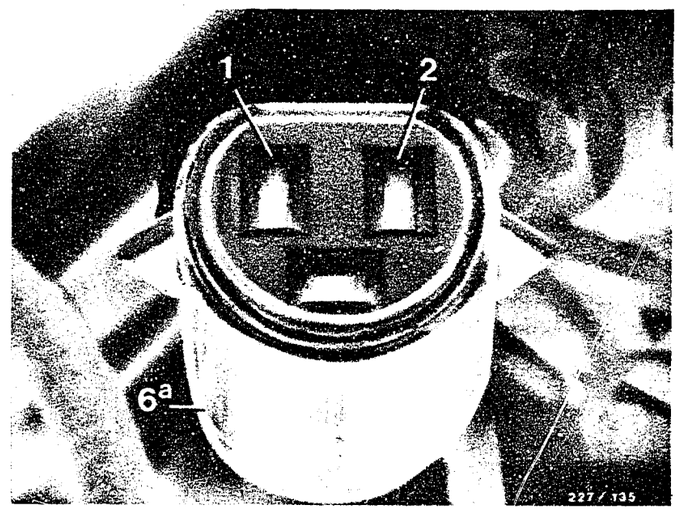
Test trigger box voltage supply. Undo three- and four-pole trigger box plug connectors. Connect voltmeter with test prod to three-pole plug connector (on wiring-harness side) see picture item 1 and four-pole plug connector (on wiring-harness side) see picture item 4. Switch on ignition. The voltmeter must indicate battery voltage. Voltage O.K.?

no →

Disconnect negative and positive cables from battery. Switch on ignition. Test for open circuit in cables from positive battery terminal to three-pole plug connector (on wiring-harness side) see picture item 1 including cables from negative battery terminal via ignition distributor (lead br/gn or br) to four-pole plug connector (on wiring-harness side) see picture item 4.
Eliminate open circuit.

Yes

Continued on C7/C8



1 = Connection - ignition and starting switch (15)

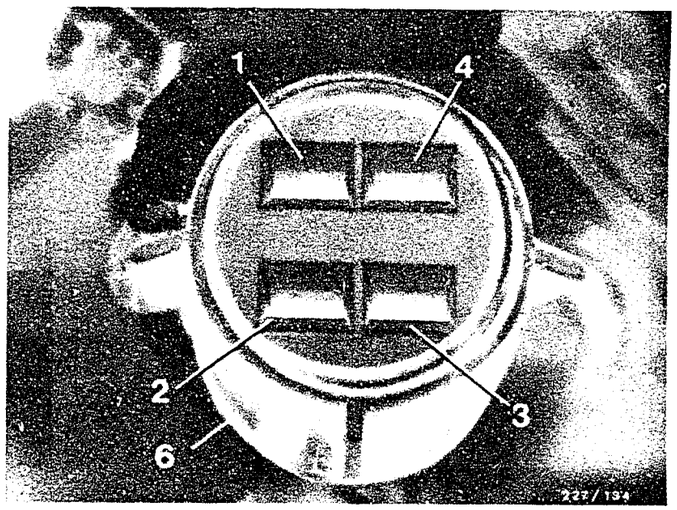
2 = Connection - ignition and starting switch (50)

6a= Three-pole plug connector

1 = Connection - ignition coil

2,3,4 = Connection - ignition distributor

6 = Four-pole plug connector



Yes

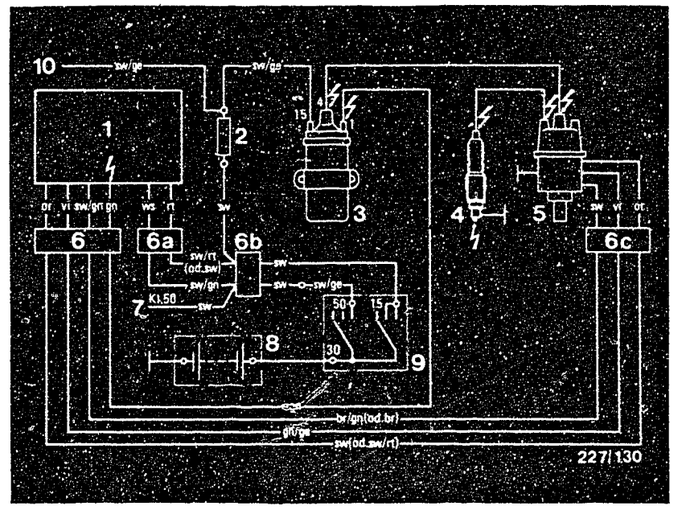
Test ballast resistor cable and ignition coil.
Ballast resistor cable
Undo both plug connectors of blue ballast resistor cable (in engine compartment on left-hand side member).
Connect ohmmeter to blue ballast resistor cable.

Resistance value 1.0...1.2 Ω.
Ignition coil
Ignition coil primary (term. 15 and 1)
1.0...1.7 Ω (take resistance of test lead with test prods into account).
Ignition coil secondary (term. 1 and 4)
7.0...12.3 kΩ.
Resistance values O.K.?

No → Replace ballast resistor cable and/or ignition coil.

Yes

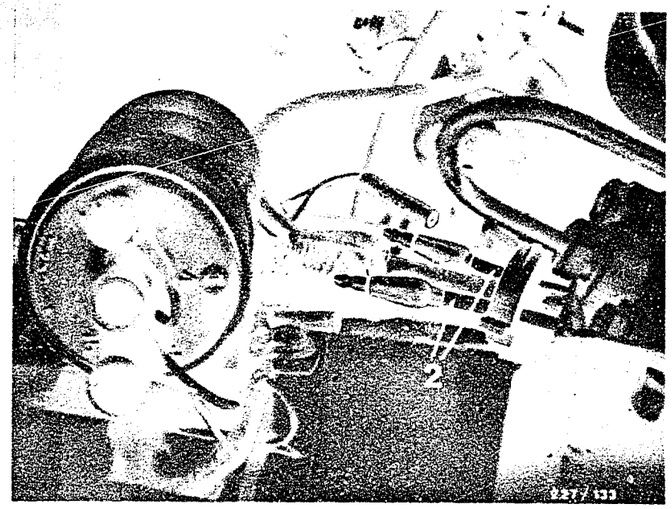
Replace trigger box.
Test completed.
Tests from B 5 not necessary.
Please note:
If the cause of the customer's problem is not eliminated, then there are further faults in the fuel system or the engine is not mechanically O.K.



1 = Trigger box
2 = Ballast resistor cable
3 = Ignition coil

= Dangerous voltages (400 V - 25 kV)

2 = Ballast resistor cable (blue)



After-sales Service

Technical Bulletin

22

Danger of Accident on Semi-conductor Ignition Systems

VDT-I-227/102 B

11.1976

Please be sure to pass this bulletin on to your employees for their attention.

The increased demands made on their ignition systems by modern engines, and the wish for freedom from maintenance, led some time ago to manufactures starting to equip their vehicles with semi-conductor ignition systems as original equipment. In most cases the performance of nearly all makes of such systems is higher than that of conventional systems, and further improvements are to be expected. This means that semi-conductor ignition systems have reached the point where contact with "live" parts or contacts (whether on the primary side or the secondary side) can prove fatal.

In this connection we should like to point out to you that the laws valid in your country regarding work on high-voltage systems must be adhered to when working on, or testing, semi-conductor ignition systems.

As a matter of principle, when working on such ignition systems the ignition is to be switched off. Included in such work are the following operations:

- Connection of engine testing equipment (timing light, dwell-tach tester, ignition oscilloscope etc.).
- Replacement of ignition system parts (spark plugs, ignition coil, ignition distributor, H.T. ignition cables etc.).

If it is necessary to switch on the ignition in order to test the system or make adjustments on the engine (to the carburetor for instance), then lethal voltages are present throughout the entire system.

This means that the danger of accident exists not only at individual components in the system (e.g. ignition distributor, ignition coil, trigger box, ignition harness), but also at the wiring harness (e.g. connection for the tachometer, diagnostic connector), on terminals, and on test equipment.

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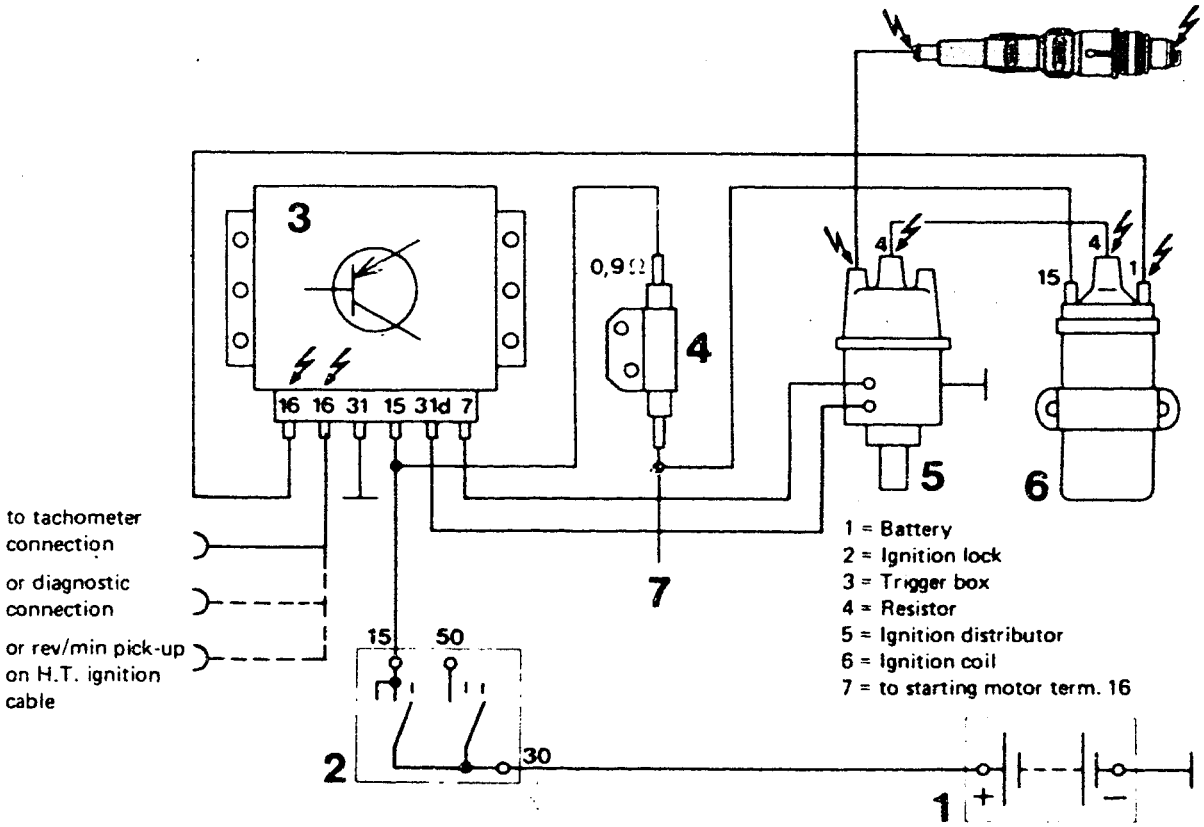
In addition, in the case of the capacitor-discharge ignition system (CDI), danger of accident is also present under the following circumstances:

- Operation of the trigger box without the ignition transformer.
- At the trigger box, (removed), relatively soon after it has been switched off (capacitor discharge).

Below is a typical terminal diagram of a semi-conductor ignition system, the danger points are marked with red high-voltage arrows. We would point out that all semi-conductor ignition systems, even the older ones, are to be regarded as dangerous in the sense as defined by this bulletin.

Please address any queries or comments concerning the contents of this publication to our representative in your country.



Terminal diagram

After-sales Service

Technical Bulletin

EFFECTS OF ELECTRICAL AND ELECTRONIC SYSTEMS ON HEART PACEMAKERS

e.g. ignition systems, Jetronic, Motronic, ABS

VDT-I-227/107 En
1.1981

Please ensure without fail that this Bulletin is passed on to your employees for their attention!

We have often been asked by some of our customers whether or not patients with heart pacemakers are endangered in any way by ignition systems. This theme was recently the subject of an examination carried out by the Ignition System Development Department of Robert Bosch GmbH in conjunction with Dr. Thull, lecturer at the Central Institute for Biomedical Technology at the University of Erlangen-Nürnberg and Biotronic GmbH & Co. of Berlin, a manufacturer of heart pacemakers. The magazine "Biomedizinischen Technik" (5/80) listed the results.

The most important discoveries in this practice can be summarized from the examination report as follows:-

1. Heart pacemakers corresponding to the latest state of the art are not affected by radiation (electromagnetic fields) from ignition systems.
2. With a stationary engine and the ignition switched off the heart pacemaker is not affected by any part of the ignition system, even when unintentionally touched. Maintenance work in the engine compartment, for example, can then be carried out without any danger.
3. With the engine running or stationary with the ignition switched on, touching current-carrying parts of the ignition system, as well as parts of any other electrical system, presents a certain danger for everybody. The heart pacemaker can here be affected under certain conditions (voltage, current and frequency).
   Patients with heart pacemakers should therefore at all costs avoid touching current-carrying parts of electrical systems.
4. Furthermore, patients with heart pacemakers are more inclined to psychic shock effects than other people, even when they receive just a harmless electric shock, because many such patients are conscious of the increased danger to the cardiac activity.

We therefore consider it inadvisable for patients with heart pacemakers to be employed in workshops or on vehicles where ignition systems are being tested or repaired. If any members of your staff have heart pacemakers please carry out the necessary measures.

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We would like to add that heart pacemakers are not expected to be affected in any way by interference from other electronic products and systems which we manufacture, such as the Antiskid System (ABS), Jetronic, Motronic, because the much greater radiation intensity of the ignition systems examined in normal use has not caused any interference to heart pacemakers corresponding to the latest state of the art.

If you should receive questions on this matter from customers, please inform them accordingly.

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Technical Bulletin

NEW DESIGNATIONS FOR IGNITION SYSTEMS

VDT-I-227/108 En
1.1983

The introduction of new ignition systems has made it necessary to reclassify all designations.

The designations listed below will be used immediately in KH workshop and sales literature.

Designation	Abbrev'd code	Meaning	Switching	Ignition control and spark advance	High-voltage distribution
Coil ignition	SZ (CI)	---------	Mechanical (breaker points)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Transistor-ized coil ignition	TSZ-K (TCI-c)	K=breaker-triggered	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Trigger box with conventional circuit techniques	TSZ-I* (TCI-i)	I=Induction-type pulse generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
	TSZ-H	H=Hall generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Transistor-ized ignition	TZ-I* (TI-i)	I=Induction-type pulse generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
(Trigger box in Hybrid technique)	TZ-H* (TI-h)	H=Hall generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)

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Designation	Abbrev'd code	Meaning	Switching	Ignition control and spark advance	High-voltage distribution
Breakerless semiconductor ignition with or without knock control	EZ EZ-K	- K=Knock control	Electronic (trigger box or control unit)	Electronic (control unit)	Mechanical (ignition distributor or high-voltage distributor)
Distributor-less ignition with or without knock control	VZ VZ-K	- K=Knock control.	Electronic (control unit)	Electronic (control unit)	Electronic (dual-spark ignition coil, or 1 ignition coil for each spark plug)

*Note: The ignition system can also be equipped with a DLS unit (digital idle stabilization) or with an ELS unit (electronic idle stabilization) or with an ESV unit (electronic ignition retardation).

After-sales Service

Motor Vehicle Service Information

TESTS ON ELECTRONIC IGNITION SYSTEMS
(TCI, TZ)
TESTER INSTRUCTIONS

VDT-I-Gen. 035 En
3.1981

The following tests are listed in older and current Tester operating instructions or in Trouble-shooting with the oscillograph.:

- "Separate ignition coil test" (concerns EFAW 213, 214, 268, AE 2000).
- Calculating the "ignition voltage reserve" (concerns EFAW 213, 214, 268, AE 2000 and MOT series).
- "Intensified insulation test" (concerns EFAW 213, 214, 268, AE 2000 and MOT series).

Nowadays transistorized ignition systems deliver more than 30,000 V secondary voltage.

To avoid damage to ignition coil, ignition cable and ignition distributor by voltage flashovers, the tests listed above should not be carried out on transistorized ignition systems.

The contents of this Service Information has already been published in the K7-Information K7-VJF 17/8012.

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